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Recombination for innovation: performance outcomes from international partnerships in China.

***R&D Management* 2017**

DOI: https://doi.org/10.1111/radm.12293

Recombination for Innovation:
Performance Outcomes from International Partnerships in China

Abstract

This paper examines the relationship between different types of international partnerships and innovation performance. By drawing on a conceptual framework which outlines how new bundles of transferrable and non-transferrable ownership advantages are created from such partnerships (Collinson and Narula, 2014), we analyze empirical evidence from a large-scale survey of 320 individual company responses from the China-based operations of foreign multinational firms alongside in-depth case studies. Our study reveals that different types of collaborative partnerships (cooperative vs competitive) are associated with different innovation performance outcomes (product vs process innovation). In addition, we find that a sustainable, reciprocal relationship between collaborative partners can generate superior innovation performance. Contextual factors including the role of government and industry characteristics have an important bearing on innovation performance in collaborative partnerships in China. We conclude with implications for researchers, managers and policymakers.

Keywords: international partnership, innovation performance, recombination, location-specific assets, firm-specific assets, China

1. Introduction

Collaborative partnerships provide an important context for combining firm-specific assets and capabilities to enhance the capacity of companies to innovate. Different types of collaborative partnership may give rise to different levels and forms of performance outcomes. For instance, in the context of M&A, recent research shows different effects of human and task integration on the innovation outcome after the transaction (Bauer, Matzler and Wolf, 2016). Furthermore, national cultural differences moderate the relationship between integration and innovation performance. In international joint ventures (IJVs) research, a wide spectrum of innovation issues has been investigated providing us with substantial insights into the antecedents, drivers and barriers of knowledge transfer to and from IJVs (Li, Zhou, and Zajac, 2009). Against the backdrop of the unprecedented growth in the number of MNEs (multinational enterprises) partnering with firms in emerging economies, there has been an increased focus on emerging economies as a distinctive context for partnerships, with a traceable influence on performance outcomes (Shi, Sun, Pinkham, & Peng, 2014).

Empirical research that examines the relationship between types of collaborative partnerships and innovation performance is still rare. In this paper we aim to help fill this important gap by building on and extending past studies on innovation in collaborative partnerships. We focus on partnerships between western MNEs and Chinese firms in China. China has witnessed unprecedented economic growth and development over the past three decades. Supported by central government policies, with varying impact by sector, many Chinese firms focus on improving their capacity to innovate, both domestically and through overseas acquisitions in advanced economies, in order to move up their respective value chains (Liu & Vrontis, 2017; Xing, Liu, Tarba, & Cooper, 2016). Innovation in firms operating in China has an important bearing on both firms' abilities to compete globally and the restructuring of the global trade and investment balance. For instance, one research project studying MNE subsidiaries in the semiconductor industry found that subsidiary autonomy and changing opportunities to access host country sources of capability contribute to the accumulation of specialist capabilities for MNE innovation (Collinson & Wang, 2012). Hence, focusing on MNEs in China and their collaborative partnerships with Chinese organizations can shed important light on the underlying mechanisms that can enable or constrain the pursuit of innovation activities, process, and outcomes.

The accepted wisdom in innovation research is that the combination of new knowledge and resources of two firms will result in higher innovation capabilities (Un, Cazurra and Asakawa, 2010). To-date, however, empirical research has yet to establish the precise association between IJVs and innovation performance (Zhou and Li, 2008), and whether different types of IJVs have similar impact on innovation performance. With few exceptions (Zhou and Li, 2008; Li, Zhou, and Zajac, 2009), the bulk of the extant research on innovation in IJV has focused on: innovation inputs, such as investment in R&D (Zhang, Li, Hitt, and Cui, 2007); the transfer of knowledge from MNE headquarters to IJVs (Reddy and Zhao, 1990); and the innovative environment within IJVs. Actual innovation performance has surprisingly been neglected (Collinson, 2016).

Furthermore, research findings on the association between partnerships in general, i.e. within country partnerships, and innovation performance are inconsistent, reporting a positive (Das and Teng, 2000), negative (Neito and Santamaria, 2007; Caloghirou et al., 2004; Dyer et al., 2006; Okamuro, 2007) and inverted U-shape (Kang and Kang, 2010) association between inter-firm collaboration and innovation performance. We contend, and make the case, that this inconsistency is due in part to the misspecification of the type of partnership and a lack of precision in defining different kinds of innovation performance. Our central premise in this paper is that the form of innovation – i.e. process or product innovation – and level of innovation performance from partnerships between MNEs and local firms are profoundly linked to the *type* of partnership. This is in line with recent studies that show that the type of partnership has a strong impact on innovation performance (c.f. Un, Cuervo-Cazurra and Asakawa, 2010). Un *et al.* (2010) argue that the breadth of new knowledge provided to the partnership and ease of access of this new knowledge determine the relative impact of different types of R&D collaborations on product innovation. Similarly, Kang and Kang's (2010) study of R&D collaborations and innovation in Korean firms found different effects of various partnership types on product innovation: collaboration with customers and universities had a positive impact on product innovation but collaboration with suppliers and competitors had an inverted U-shape relationship with product innovation.

In this study, we focus on forms of collaboration undertaken by MNEs with local firms in China (collaborative vs. competitive), the transfer and combination of assets, capabilities and knowledge between the foreign and local partner firms and the impact thereof on product and process innovation performance. A central aim of our research is to advance understanding of

the types of innovation-related assets and capabilities pooled by respective partners and the degree to which these (and the new ownership advantages created by the collaboration) are location-specific vs. transferrable. Collinson and Narula (2014) provide a conceptual framework for exploring how new bundles of transferrable and non-transferrable assets and capabilities emerge from international partnerships and can give rise to new competitive advantages. We adopt and develop this framing, combining elements of international business theory with elements of innovation studies approaches in our analysis of survey data from a large sample of China-based partnerships.

A further contribution of our research is to go beyond the R&D context (and the use of patent data as the primary proxy measure of innovation output) to analyze process and product innovation using a range of output measures that are appropriate to these different forms of innovation. It is suggested that a nuanced understanding of innovation output may significantly advance innovation research (Lewin, Kenney and Murmann, 2016). Moreover, by considering a range of partnership types we move beyond the focus in prior studies on equity vs. non-equity arrangements. Finally, we have a general aim to learn from first-hand empirical evidence, reducing our reliance on secondary data which has certain weaknesses, as outlined by Beamish and Lupton (2009).

The remainder of the paper is structured as follows. We present a theoretical framework and set of testable hypotheses around types of partnership and particular kinds of innovation performance. Our survey methods and sample are then explained and the results are presented, with a discussion section linking back to prior studies and our theoretical framework.

2. Theoretical Framework and Hypotheses

The existing research on innovation in collaborative partnerships addresses important topics in innovation management (Liu, Sarala, Xing, & Cooper, 2017), including integration and innovation output in M&A (Bauer, Matzler, and Wolf, 2016; Bauer and Matzler, 2014), knowledge acquisition and innovation capabilities in IJVs (Zhou and Li, 2008; Li, Zhou, and Zajac, 2009; Lane, Salk, and Lyles, 2001), and the influence of shared mental modes on innovation activities in M&A (Dao, Strobl, Bauer, & Tarba, 2017). Following Zhou and Li's (2008: 1114) argument that innovation is "an outcome of IJVs' combinative capabilities, reflecting how well foreign and domestic partners collaborate in improving operational efficiency and effectiveness, and in building new competence", we build on recent advances

on the link between recombination and bundling of new knowledge and innovation performance. Recent conceptual developments in IB have emphasised the importance of recombination (Verbeke and Yuan, 2010; Verbeke, 2008) or bundling (Hennart, 2009) of resources, assets and capabilities from both sides of a partnership to create new ownership advantages (Oa).

INSERT FIGURE 1 HERE

Verbeke and Yuan (2010; p.95) propose a 'New Typology of 'O' Advantages' which describes four kinds of Oa applicable to international partnerships. Building on this line of reasoning, a recent study proposed a framework to conceptualize how new 'bundles' of transferrable and non-transferrable ownership advantages are created in collaborative partnerships (Collinson and Narula, 2014). As shown in Figure 1, this links the geographic source of the Oa (home country or host country) to the transferability of this advantage (transferable and non-transferable, or location-bound). New forms of recombinant Oa may be more or less location-bound depending on the transferability of the assets, resources or capabilities involved. We posit that innovation performance will result from the combination of transferable Oa of both MNEs and local partners in China and the ability and willingness/incentive of the IJV to assimilate and apply these advantages.

As proposed by Zhou and Li (2008: 1114): innovation is the product of a "*collaborative* and *cumulative* process that requires both foreign and local partners to contribute substantially to a series of activities along the value chain" (emphasis in original). Given that each type of collaboration between MNEs and Chinese firms – collaborative or competitive – differs in terms of the breadth of knowledge provided to the IJV, and in the ease and incentive of accessing, recombining and applying the new knowledge, we hypothesize below that the type of partnership matters when it comes to innovation performance in international partnerships.

Based on Verbeke and Yuan's framework, one would anticipate that the MNE brings transferrable Oa's such as brands, technology, intellectual property rights (IPR) and managerial capabilities which underpin their existing competitive advantages. Collinson and Rugman (2008) term these firm specific advantages (FSAs), to differentiate them from country specific advantages (CSAs) which are location-bound (Collinson and Rugman, 2008). Local firms in China may also contribute these kinds of assets, configured to the Chinese context, but transferrable elsewhere, alongside location-bound assets, such as cheap

labour, market knowledge, locally-available materials, or government support. They are also likely to have developed locally-applicable knowledge, locally-appropriate management practices and local network connections (*guanxi* in China) which have limited transferability to other contexts. Reciprocal sharing and recombination of these respective, transferable and non-transferable Oa's is expected to lead, if successful, to 'higher-order' advantages in Verbeke's terminology.

The main advantage of the frameworks from Verbeke and Yuan (2010) as well as Collinson and Narula (2014) is that it specifically addresses the international dimension of partnerships, considering the degree to which the initial assets, capabilities and knowledge (pre-partnership) and the resulting advantages from the recombination (post-partnership) are internationally transferable. This helps us better understand the degree to which and ways in which such partnerships provide location-specific advantages, limited in this empirical case to the Chinese market context and/or internationally-transferable advantages. In the case of the latter we should gain insights into the importance of partnerships with MNEs as a source of assets, capabilities and knowledge for Chinese firms looking to internationalize. In addition, it helps us address the limitation of within country frameworks such as Un *et al.* (2010: 676) that do not take into consideration differences across countries. For instance, Un *et al.* (2010) classify breadth of knowledge as low in collaboration with competitors. However, this is less likely to be the case in collaborative partnerships between a Western MNE and a local Chinese firm given the significant differences in capabilities between the two partners. Moreover, in this study we focus on a specific sub-set of ownership advantages resulting from Oa recombination in international partnerships in China. We examine how different forms of partnership result in different kinds of joint innovation advantage. Specifically, we measure changes in the performance of partnerships in terms of generating superior process and product innovation.

2.1. Process and Output Innovation

In order to operationalize the above framework we needed to narrow the scope of ownership advantages and underlying assets, capabilities and knowledge to be empirically examined. Our solution was to focus on measureable changes in the innovation capacity of the partnership, differentiating between process and output innovation. We define these according to the Community Innovation Survey (CIS) definition, which explicitly differentiates between process and product innovation: "Innovation, for the purpose of this

survey, is defined as new or significantly improved goods or services and/or the processes used to produce or supply all goods or services" (European Commission, 2012).

A process innovation is the 'implementation of a new or significantly improved production process, distribution method or support activity for goods or services.' A product innovation is 'the market introduction of a new or a significantly improved good or service.' We extend the latter category by including new products or services, which expand a firm's overall portfolio of products and services, as a further indication of innovative capability. We therefore use the term 'output innovation' for the purposes of our survey, to encompass both product innovation and portfolio extension.

The CIS survey and the Oslo Manual measures that underpin the survey have been used extensively in innovation studies (Mairesse and Mohnen, 2010; Mairesse and Robin, 2010; Criscuolo and Haskel, 2003) and are built on established principles in the field (Patel and Pavitt, 1995). Duysters et al. (2011) have used CIS data to analyze the effects of alliance portfolios which include different partnership types (competitor, customer, supplier, and university and research center) on firms' innovative performance. Closer to our own approach, Faems et al. (2005) reveal a positive relationship between inter-organizational collaboration and innovative performance using CIS data on Belgian firms. Their study finds that the impact on innovative performance differs depending on the nature of the partners involved.

2.2. Types of Partnerships and Innovation Performance

A large body of research has looked at whether partnerships between organizations enhance or stifle innovation (Das and Teng, 2000; Neito and Santamaria, 2007; Caloghirou et al., 2004; Dyer et al., 2006; Okamuro, 2007; Kang and Kang, 2010). This body of research has produced conflicting and confusing results. Scholars attribute such inconsistencies to, among other factors, the misspecification of types of partnerships (Un et al., 2010) and measures of innovation performance (Fritsch and Frank 2004; Aschhoff and Schmidt's 2008). In line with Un et al.'s (2010) core argument that type of partnership matters when it comes to innovation performance, we contend that different types of partnerships – collaborative (with customers and suppliers) and competitive (with competitors) – have different impact on different innovation categories – process versus output innovation. This is because IJVs have access to different types of knowledge (Un et al. 2010) and "exhibit different behaviour" and allocate

different resources and capabilities depending on the partnership types (Kang and Kang, 2010). Empirical research supports this view. Fritsch and Franke's (2004) and Aschhoff and Schmidt's (2008) studies of German firms, Kang and Kang's (2010) study of Korean firms, Belderbos et al.'s (2004) study of Dutch firms and Lhuillery and Pfister's (2009) studies of French firms, all report that innovation performance varies according to the type of partnerships.

Overall, existing empirical evidence shows that generally competitive partnerships have a positive association with innovation performance. In contrast, cooperative partnerships have a negative or no association with innovation performance. Fritsch and Frank (2004) found that customer collaboration has a negative impact, collaboration with suppliers has no impact but collaboration with competitors has a positive impact on innovation performance. Similarly, Belderbos et al. (2004) reported that collaboration with competitors has a positive impact while collaboration with suppliers and customers has no significant impact on innovation performance. Ascholff and Schmidt (2008) reported that partnerships with competitors, suppliers and customers have no significant impact. In contrast, Un et al (2010) reported that collaboration with competitors tends to harm product innovation, while collaboration with suppliers have a strong positive impact on product innovation. However, as noted earlier, Un et al.'s study focuses specifically on R&D partnerships within a single country – Spain. Furthermore, although we accept that accessing knowledge in competitive partnerships is low because, generally, "competitors actively block the transfer of knowledge to rival firms" (Un et al., 2010: 678), this is less likely to be the case in collaborative partnerships in China. Indeed, there is a widespread belief that MNEs are, perhaps willingly, fostering their future competitors in China by relinquishing control over their valuable knowledge. A number of studies report that MNEs are trading know how for access to the Chinese market (c.f. Hout and Ghemawat, 2010; Li and Kozhikode, 2009). Research indicates that the innovation capabilities of Chinese firms benefit from collaboration with MNEs and this in turn underpins a growing level of competitiveness in some industry sectors, such as the Chinese automobile industry (Sun, Mellahi and Thun, 2010; Zhao and Anand, 2009).

2.3. Type of Partnership and Product Innovation

In IJVs, the key determinants of product innovation are the transferability of the MNEs and local partners' knowledge and innovative capability, the breadth of this knowledge, as well as IJVs' ability and incentives to recombine and apply this knowledge to develop new products.

That is the breadth and ease of access new knowledge does not by itself lead new product development. The ability and incentive to apply the new knowledge will also influence the IJV's product innovation performance. This depends on resource relatedness and complementarity across the two firms that form the IJV (Farjoun, 1998), which are consistently found to be a good predictor of product innovation in partnerships (Makri, Hitt and Lane, 2010; Un et al., 2010). This is because resource relatedness facilitates the exchange, integration and application between partner firms, leading to higher levels of product innovation (Larsson and Finkelstein, 1999; Katila and Ahuja, 2002). Makri, Hitt and Lane (2010: 606) argued that the more related "the two firms' technological knowledge, the more quickly the acquired firm's knowledge can be assimilated and commercially exploited". Similarly, Cohen and Levinthal (1990) reported that prior related knowledge is a necessary pre-condition for firms to identify and appreciate the value of new external knowledge unrelated to their core business. Moreover, scholars report that knowledge flows in partnerships tends to occur in activities closely related to the partners' existing practice (c.f. Kogut and Zander, 1992). In a similar vein, Zahra and George (2002) contend that firms need prior related knowledge to be able to identify and acquire externally generated knowledge. The above analysis suggests that even when MNEs are able to transfer some of their FSAs and Oa, the ability of the IJVs to take advantage of this knowledge by recombining it and applying it to produce new product depends to a large extent on its relatedness to existing activities.

In addition to knowledge relatedness, complementarity of partners' FSAs and OAs exposes the IJV to new knowledge which helps them extend the scope of their innovation capability leading to new innovations (Larsson and Finkelstein, 1999; Katila and Ahuja, 2002). Harrison, Hitt, Hoskisson, and Ireland (2001: 679) found that complementarity of resources in inter-firm collaborations offers opportunities for "enhanced learning as well the development of new capabilities" by exposing the partner firms to new, diverse, but related knowledge (see also Hitt et al., 1996).

It is worth pointing out that although Un et al., (2010) posit that knowledge breadth in competitive partnerships is very low, we contend that in collaborative partnerships between western MNEs and firms located in China the knowledge gap is significant (Hitt, Li, and Worthington, 2005). Overall, the above arguments imply that, given that competitive firms often possess related and complementary knowledge, in competitive partnerships the

combined knowledge held by the partner firms is likely to facilitate the sharing, assimilation and exploitation of knowledge and thereby enhance product innovation (Cassiman et al., 2005; Hagedoorn and Duysters, 2002).

Compared to competitive partnerships, cooperative partnerships partners' knowledge and technical capabilities are highly unrelated, and the ability and incentive to exchange, understand and apply combined knowledge is poor. Over two decades ago, Inkpen (1997: 354) argued that "if the IJV is involved in an unrelated business, it is unlikely that the primary rationale for collaboration will be knowledge creation". Moreover, product innovation is not an operational priority, nor a business objective in cooperative partnerships. Tsang (2002) reported that "the strategic importance of the venture concerned, instead of the learning intent of the parent" is what determines the activities of the venture. Therefore, product innovation is expected to be low in cooperative partnerships due to low receptivity to learn knowledge related to new product development. Overall, research shows that product innovation is highest when knowledge relatedness is high and lowest when knowledge is distal. Furthermore, most MNEs, do not collaborate with suppliers and customers in their core business and therefore their FSAs and Oa are not easily transferable to the IJVs.

Similarly, for local suppliers and customers may be more interested in knowledge that help them improve the efficiency of their processes than engaging in developing new products for the MNE. This may ultimately "demotivate the local partner" from acquiring the new knowledge flowing from the MNEs to develop new products, resulting in a "worse-off situation for IJV (product) innovation" (Zhou and Li, 2008). Zhou and Li (2008) noted when the incentive to learn certain knowledge from foreign partner in an IJV is low "even if foreign investors bring already-developed products to the IJV, further adaptation of these products to the local market may be seriously hindered if local partners' motivation is weak".

Thus, we propose that:

H1a. Competitive partnership is positively associated with product innovation.

H1b. Cooperative partnership is negatively associated with product innovation.

2.4. Type of Partnership and Process Innovation

In contrast to competitive partnerships, collaborative partnerships are expected to have higher levels of process innovation (Freel and Harrison, 2006). This is because collaborative agreements with suppliers and customers expose the MNE to new, local knowledge and induce the focal MNEs to make adjustments to its operational processes in response to local needs (Li and Kozhikode, 2009). This may translate into innovations in the way the MNE procures, produces, distributes and markets its products or services in China (c.f. Li and Kozhikode, 2009). Also, although competitors in China may have similar knowledge and use similar processes, which limit the scope for process innovation, they could expose the focal MNE to knowledge specific to the Chinese business environment that requires significant adjustment to the way the firm operates. Indeed, scholars (see for example Luo, 1997 and Hobday, 1995) reported that engaging in process innovation is one of the primary reasons MNEs forge partnerships with emerging market firms. Li and Kozhikode (2009) noted that emerging market firms are better placed to contribute to process innovation than output innovation. Based on the literature review, competitive partnerships are not conducive to process innovation; competitors tend not to share their operational practices. By contrast, cooperative partnerships involve mutual learning underpinned by mutual trust, including cross-learning of best practices. Process innovation requires pooled resources and capabilities and is often driven by a shared interest in improving product or service quality and reliability or the dissemination of process technology, for example across firms cooperating within a single supply chain.

Thus, we propose that:

H2a. Competitive partnership is negatively associated with process innovation.

H2b. Cooperative partnership is positively associated with process innovation.

H2c. Process innovation is stronger for cooperative than competitive partnership.

3. Methods and Sample

A two-part study of contractual partnerships, alliances and equity joint-ventures in China, between foreign MNEs and Chinese firms was undertaken to examine the above hypotheses. We established a number of defined categories in the pilot phase of the project. This involved a series of interviews with case study firms to develop the survey questionnaire. Respondents consistently defined IJV's as a subset of partnerships which involved co-investments from both parties (western MNE and local Chinese firm) with the main objective of co-developing

a product or process for the local market, or for the training and development of local firms, normally as first-tier suppliers. There were generally two forms of IJV; those created because of a legal requirement binding foreign investors (e.g. in the aerospace industry, related to the government-controlled AVIC structure) and those created because the firms saw an IJV as the most effective structure for managing their collaboration. Other forms of partnership involved contracted buyer-seller relationships, which also invariably required the integration of assets and capabilities and joint-innovation at some level.

The first part involved a questionnaire-based survey of British, European and US firms based in China, across a range of industry sectors. The second part resulted in a set of 30 in-depth case studies across 20 firms, developed through 105 interviews with managers, engineers, scientists and plant-level personnel. Interviews were conducted both in the home country location of the firm (USA, UK and various parts of Europe) and in China. The overall study spanned a two-year period from the start of 2007.

This paper primarily examines the findings of the survey, which yielded 320 individual company responses from the China-based operations of the foreign multinational firms. The sample comprised of 181 US firms, 88 from the mainland EU and 51 from the UK. The average presence in China was 12.63 years. The longest presence is 28 years, while the most recent MNE has 2 years' experience only. Further summary statistics are provided in Table 1. The majority of partnerships (215 firms) were with competitors, suppliers or customers. Customers are the largest individual type of partnership (N=109), representing slightly more than 34% of the sample. Note that other types of partnerships, such as public research institutions and contractors represent a substantial portion (32.8%) of the sample. Most of the surveyed firms were involved in manufacturing, particularly in the machinery and equipment, electrical and optical equipment and chemicals-related sectors. On the other hand, very few partnerships (5% of the sample) have partnerships that are 10 years or more. Finally, the majority of firms in our sample are medium size, with about 62% of the sampled firms having between 250 and 999 employees.

INSERT TABLE 1 HERE

Because large MNEs engage in a wide variety of joint-ventures, contracted partnerships and supply-chain relationships, even in a single overseas market, we focussed on specific joint-ventures and partnerships within these firms as the unit of analysis, rather than the overall firm. Pilot studies led us to this unit of analysis and emphasised the need to gather evidence

of innovation that could be measured in some way, traced back to joint-activities and compared across firm and industry sector contexts.

Both the questionnaire and the interviews examined partnership innovation activities to understand the current scope and future implications of joint output or process development projects, technology-sharing, training and joint-learning activities within these partnerships. The scale of the project allowed us to compare patterns across different industries and different types of partnership as well across firms that were exporting against those that were selling into the local Chinese market.

As discussed above we purposefully focused on output and process innovation performance. Measures to capture innovation performance resulting from technology transfer, the sharing of capabilities and exchange of knowledge were taken from the Oslo Manual (OECD and Eurostat, 2005) which is used by the European Community's Innovation Survey (CIS) to compile the European Innovation Scoreboard. Further detail on how we operationalized these measures is provided below.

3.1. The Dependent Variables

Our dependent variables are output innovation and process innovation. Output innovation captures innovations related to new product development and the quality and range of the firm's output. Process innovation consists of innovations related to the way the firm's output is realized.

3.1.1. Product Innovation

Output innovation is captured by four constructs, namely: RPS (range of products and services), QRP (quality and or reliability of goods or services), DNP (domestic new product), and ENP (export new product). Since some firms might be fully domestic or fully export oriented, a zero score cannot always be interpreted as a low innovation output. We therefore used a weighted average of DNP and ENP, where the particular score was only taken into account if that score was relevant. For example, if a firm focuses on domestic market only, then only its score in DNP would be taken into account. To do this we used six additional items about the importance of manufacturing, new product development, and selling services for local and export markets. Respondents were asked to rate the importance of the following activities - on a 5 point scale from unimportant to very important - as a focus for the partnership: manufacturing for domestic market; Selling services to the domestic Chinese

market; New product development for domestic market; Manufacturing for export; Selling services for export; New product development for global/regional markets.

We set two dummy variables relating to the importance of each activity. First, Ddom (domestic dummy) is set equal to 1 if at least one of the first three items is deemed moderately important or better, and zero otherwise. Second, Dexp (export dummy) is set equal to 1 if at least one of the last three items in the above list are seen as moderately important or better, and zero otherwise.

Using these two dummies, we merged DNP and ENP to produce a new variable, which we call 'new product' (NP), as a weighted average as follows:

$$NP_i = \frac{Ddom}{Ddom + D\exp} DNP_i + \frac{D\exp}{Ddom + D\exp} ENP_i$$

For example, if a firm is only export oriented, then Ddom=0 and only its score in ENP counts. There were 14 cases in our sample where respondents signalled that neither domestic nor export activities were important. These cases were treated as missing observations.

Thus, we have three variables representing product innovation: NP (new product), QRP and RPS. The next step is to attempt to reduce the dimension of this construct via factor analysis. As can be seen from Panel A of Table 2, the first factor explains only slightly more than 47% of the variability of the three variables. Although the rule of thumb is to only accept factors that have eigenvalues of 1 or more, we lower this requirement since the additional factor explains almost an additional 30% of the variability. The rotated solution produces two uncorrelated factors with eigenvalues that are both greater than 1. Together, these two factors explain 76.63% of the total variability of the three variables.

The factor loadings shown in Panel B of Table 2 clearly indicate the nature of the two factors. The first factor is related to two dimensions, namely new product (NP) and quality and reliability of products (QRP). It loads positively and almost equally on both dimensions and is virtually unrelated to RPS. We label this factor Output-QQR (for quantity, quality and reliability). This factor can be interpreted as the ability to produce more and better products. The second factor loads mainly on RPS, with a coefficient of 0.99, and is only marginally related to the other two variables. Thus, this second factor could be thought of as the ability to improve the range of products and services, labelled as Output-RPS.

3.1.2. Process Innovations

The process related innovation outputs consist of six dimensions. The initial solution, shown in Table 3, Panel A, gives two factors with eigenvalues greater than one, but these two factors only explain 50.79% of the variation of the six dimensions. We therefore added a third factor whose eigenvalue is closest to 1. This increases the explanation to 65.39%. The rotated solution shows that the uncorrelated factors contribute roughly equally to explaining the six dimensions of process-related innovation output. In panel B the factor loadings show an even distribution of individual dimensions across the three factors. Each factor loads highly on two dimensions and are generally low on the remaining dimensions.

The first factor relates to CRT (reduced time to respond to customer needs) and PLT (reduced production lead time). Both of these dimensions are related to time efficiency and hence this factor will be labelled: *Process-Time-Efficiency*. The second factor loads on PDC (reduced product design costs) and SR (reduced scrap rate). These two dimensions relate closely to cost efficiency. Hence, we label this factor: *Process-Cost-Efficiency*. The final factor is highly correlated with CPS (improved capacity of production or service) and LC (increased local [China] content). These two dimensions are fairly related to the capacity of the firm. We label this factor *Process-Capacity***.**

INSERT TABLES 2 AND 3 HERE

3.2. Independent Variables

The main independent variable is the type of partnership. This is captured by whether the partnership is with a supplier, a customer, a competitor, or 'other' which includes public research institutions and consultancies. Thus, we have two variables for cooperative partnership which are proxied by two dummies for supplier and customer responses. The competitive partnership is proxied by the competitor dummy, which is set equal to 1 if the respondent selected the 'competitor' option and zero otherwise. These three dummies are contrasted with the fourth choice, 'other', which is deemed to be neither competitive nor cooperative.

3.3. Control Variables

Although our study is interested primarily in the partnership effect on innovation, other firm characteristics and fundamentals also play a role in determining the level of innovation within

a particular firm. Size, age, income and sector are obvious candidates. The following is a list of the control variables used in our empirical models.

3.3.1. Age/Experience

Age is measured by the number of years the firm had been present in China. The average age was 12.63 years, with a standard deviation of 3.99 years. The age ranged from a minimum of 2 years to a maximum of 28 years.

3.3.2. Revenue

Financial slack has a significant impact on innovation (Mellahi and Wilkinson, 2010). We therefore included revenue as a control variable and measured as an estimate of the firm's total revenue in their China operation(s) during the last three years. The average revenue is £0.67 million with a standard deviation of £2.39 million. We standardize this variable by dividing the raw figures by 10^6.

3.3. 3. Sector

Firms belonging to different sectors may be expected to have different levels of innovations. We therefore control for this effect by considering four sectors, namely manufacturing, construction, service, and other. Our sample is dominated by manufacturing, with 284 companies, followed by service companies with 23 firms. The construction sector counts only 4 firms. The remaining 9 firms were from sectors other than these three. Given the limited number of construction firms we only use manufacturing and services sector firms. These are now contrasted with construction and 'other' firms.

3.3. 4. Length of Partnership

We expect long term partnerships to be more fruitful as partners have more time to build confidence. The length of partnership is grouped into three categories: 3 years or less, 4 to 9 years inclusive, and 10 or more years. The last two options represent two dummy variables for length of partnership. Thus, we set a long partnership dummy equal to 1 for partnerships of 4 to 9 years and zero otherwise. Similarly, we set a very long partnership equal to 1 for 10 or more years. These two dummies will contrast with the short partnership.

4. Results

4.1. Findings from quantitative survey

The results are based on a standard linear regression model,

$$Factor_i = \beta_0 + \sum_k \beta_k X_{ik} + \varepsilon_i$$

where the X's are independent variables, the betas are unknown parameters, and ε_i is a disturbance term.

The results for output innovation are presented in Table 4. We first note that most of the control variables are statistically insignificant. There are two exceptions though. First, the length of partnership is important for Output-QQR only. Although there is no significant difference between short and long term partnerships, very long partnerships have the largest coefficient (0.927; p-value < 0.001) of both regressions. Given that the dependent variable has zero mean and unit variance, the scale of this coefficient indicates that, roughly, about half the QQR output innovation is due to the extensive length of partnership (> 10 years). The RPS innovation is also positively influenced by the length of partnership, but to a lesser extent than QQR (the coefficient is only significant at the 10% level).

The coefficient of the competitive partner dummy variable is positive for both dimensions. Competitive partnership is significantly related to both QQR (0.390; p=0.065) and RPS (0.567; p= 0.007). These results suggest that competitive partnerships have a stronger positive impact on RPS than QPR. Nevertheless, both dimensions are significantly enhanced by competitive partnership. So, our first hypothesis H1a is not supported. Therefore, we conclude that competitive partnership is positively associated with process innovation.

For cooperative partnerships the results show two distinct cases. For QQR, for both customers and suppliers, the association is negative, but is not statistically significant. On the other hand, RPS is significantly and negatively associated with supplier partnerships (-0.354; p=0.026) but not with customers. Thus, hypothesis H1b is partially supported.

INSERT TABLE 5 HERE

On the process innovation front, there are fewer significant cases compared with output innovation. Table 5 presents the results for the three process dimensions. The hardest to explain dimension is the Process-Time innovation. With the exception of cooperative

partnership with suppliers (-0.350; p=0.027), none of the explanatory variables are significant, which explains the very low R-squared of 2.57%. However, contrary to expectations, the coefficient of supplier partnership dummy is negative rather than positive. This goes against our hypothesis H2b. Overall, the results for the both supplier and customer partnerships do not provide support for H2b - apart from the significant but negative coefficient of the supplier dummy on the "Time" innovation, all of the remaining five coefficients are significant.

The competitive partnership coefficients are positive but only significant in one out of the three dimensions. Although the effect of competitive partnership is neutral for the PRC_TIME and PRC_COST dimensions, it is highly significant for the PRC_CAPACITY dimension (0.733; P=0.000). Thus, hypothesis H2a is only partially supported in the sense that competitive partnership is not associated with all innovation process dimensions.

Given that the cooperative partnership dummies are either insignificant or negative, while the competitive dummy is highly valued, positive and significant in one out of the three cases, it is therefore reasonable to conclude that the strength of the relationship is stronger for the competitive partnership. However, strictly speaking we cannot compare the two significant coefficients since they relate to different innovation dimensions. Still, given the insignificant results in both cases, we cannot confirm our hypothesis H2c.

As with output innovation, the length of the relationship has the strongest effect on innovation process. The coefficients are high and significant in two out of three cases. Thus, as with output innovation, long term relationship results in significantly higher process innovation.

4.2. Further Insights from Case Studies

We gain a better understanding of the above results through the 30 in-depth case studies we compiled, across 20 firms, developed through 105 onsite interviews. These provide insights into the process of asset recombination and some of the factors that influence the innovation outcomes of these partnerships. Here we focus on explaining two of our strongest results: first why partnerships of over 10 years appear to result in significantly higher process and output innovation (particularly QQR output innovation); second, why output innovation (proxy by two dimensions: QQR - quality and reliability of products and RPS - range of products and services) is positively and significantly related to the competitive partnerships.

MNEs in China provide local partners with particular kinds of assets, including technology, intellectual property rights (IPR) and capabilities for process and product development. In return they receive particular kinds of assets, such as land, infrastructure, labour and access to local suppliers and/or customers, as well as help building relationships with Government organisations. The general patterns of reciprocal exchange and integration of Oa advantages revealed by our survey match the framework outlined in Figure 1. Recombinations of these respective non-location-bound and location-bound assets can result in improved innovation outcomes and our findings help understand when, where and why this is the case.

Both the questionnaire results and the case study interviews show that successful partnerships between MNEs and local Chinese customers were more likely to lead to an increase in local content, quicker supply times and reduced response times to meet customer needs, as well as a higher number of new products developed for export in collaborative partnerships. Local customers were more likely to learn about new or improved processes such as marketing services from their MNE partners and about other 'capable' suppliers. MNEs gained more in terms of new channels to market from local customers. Manufacturing and production expertise together with financial resources were cited as the major benefits from the partnership.

Partnerships between MNEs and local Chinese suppliers on the other hand are more likely to result in reduced scrap rate (a measure of plant-level productivity), reduced operating costs for services and reduced production lead times. Local suppliers learned new and improved capabilities for production or processing from their MNE partners alongside knowledge about operating in different business environments. MNEs gain access to other local suppliers in return. The combination of the new knowledge enhanced the IJV innovation capabilities. Disclosures of know-how, designs and patterns for innovation and the transfer of management capabilities were cited as the major benefits from these partnerships.

Partnerships with local competitors tend to focus on manufacturing and developing new products for the domestic market. Relative to the other kinds of partnership there is a more balanced, two-way flow of assets and capabilities. Both sides report that they access new and improved capabilities for production or processing, for R&D-related technology and new and improved products or marketing services, from their respective partners. There is relatively less sharing of suppliers or new routes / channels to market, but again the exchange is more even between the two partners.

5. Discussion

5.1. Theoretical implication

This study has sought to shed some important light on the nature of the collaborative partnerships between MNE with local Chinese firms and the resulting innovation performance. Our study provides some important contributions to the literature on innovation in collaborative partnerships. First, we posit that the conflicting results on innovation performance in international partnerships are probably due to the failure to differentiate between different types of partnerships and forms of innovation (process and output). Specifically, we advocate that partnering with competitors may have different impact on innovation performance than partnering with customers and suppliers. Our approach is shaped by prior work (Verbeke and Yuan, 2010; Collinson and Narula, 2014) leading us to focus on how recombinations of resources, assets and capabilities from both sides of a partnership can create new ownership advantages (Oa).

Second, our study lends support to proposition that different kinds of collaborative partnerships give rise to different kinds of performance outcomes. Each places a different requirement on the situated organizational design to align with and match the demands of partners involved in collaborative partnerships (Albers, Wohlgezogen and Zajac, 2016). In particular, the distinctions between cooperative and competitive partnerships and between product and process innovation performance are highlighted in our study.

The main quantitative findings are summarised in Table 6. As predicted, our results show that competitive partnerships are positively associated with output innovation. Specifically, output innovation (captured by two dimensions: QQR - quality and reliability of products and RPS - range of products and services) is positively and significantly related to competitive partnership. Also, as predicted, the results show that cooperative partnership is negatively associated with output innovation, albeit the strength of the association is weak. The results reveal that cooperative partnerships have no significant effect on QQR, and while only partnerships with suppliers have a significant impact on RPS, the effect is nevertheless negative. Our results support our core thesis and underscore the important of differentiating between types of partnerships when examining the link between international partnerships and output innovation performance.

INSERT TABLE 6 HERE

Our results on the association between types of partnerships and innovation process produced mixed results. The results show that competitive partnership is positively associated with process innovation. Competitive partnership resulted in significant improvement in capacity of production or service but did not lead to significant reduction in production lead time and or reduction of product design costs. Our prediction that cooperative partnership is positively associated with process innovation is rejected. Most of the estimated effects of the cooperative partnership dummies on process innovation has an unexpected negative sign and are not significant in any case. Similarly, our prediction that cooperative partnerships have stronger association with innovation process than competitive partnerships was not supported. These results show that the link between types of partnerships and innovation performance is clearer with product innovation output than with process innovation.

A substantial finding is that the length of partnership is significant in more cases than any of the partnership dummies. We find that about half the QQR output innovation is due to the extreme length of partnership (> 10 years). The RPS innovation is also positively influenced by the length of partnership, but to a lesser extent than QQR. With high valued and highly significant coefficients in two out of three cases, long term relationships result in significantly higher process innovation.

Our findings point to particular kinds of resource relatedness and "combinational potential" underpinning particular kinds of innovative outputs. The above results help us unpack some of the details about which partnerships and associated conditions give rise to which kinds of innovation outputs. One conclusion we can draw from the above findings, which is further validated by the in-depth case studies, is the strong link between long-term partnerships and superior performance in process innovation. The formation of strong social ties, shared values and efficient ways of communicating as well as the development of complementary expertise and establishing balanced reciprocity all come together only after a considerable number of (10 +) years (Dhanaraj et al., 2004; Luo, 2001, 2002). In particular, our research indicates that the effect is strongest for particular kinds of (competitive) partnership and particular kinds of output innovation (QQR).

5.2. Research context, limitation and future research

Our research context is China, whereas joint-ventures between competitors are often mandated by government agencies in China as a condition of market-entry and with the

specific intention of improving indigenous innovation capabilities. We found many examples of these, particularly in industry sectors such as aerospace, automotive and pharmaceuticals. These sectors feature strongly in China's 5-Year technology development plans, as well as being associated with highly attractive domestic markets. This represents an additional contextual factor which may partly explain our findings.

Research on organizational ambidexterity (Junni, et al 2015; Junni, et al, 2013) also provides some insights into these findings. An organization's capacity to pursue both exploratory and exploitative forms of innovation and to vary the balance according to changes in market opportunities and competitor behaviour is critical to firm performance and survival (Chen and Kannan-Narasimhan, 2015). Our study suggests that mutually exclusive innovation strategies/processes can be successfully reconciled, potentially explaining aspects of our findings. Recent research has examined how shared mental models, developed prior to an acquisition, can affect exploration and exploitation innovation activities in the post-acquisition phase (Dao, Strobl, Bauer, & Tarba, 2017). Another recent study found the team composition of returnee and local entrepreneurs is conducive to exploring and exploiting innovation and entrepreneurial opportunities in the context of entrepreneurial ecosystems (Liu, 2017).

But to be clearer and more precise about some of our findings requires further research on the co-existence of cooperative and competitive arrangements. The 'coopetition model', defined as the simultaneous pursuit of collaboration and competition, may offer additional insights to advance this line of inquiry (Bengtsson & Raza-Ullah, 2016). A recent study found that relational governance improves product innovativeness in vertical alliances that experience growing levels of coopetition, whereas transactional governance reduces product innovativeness with growing coopetition (Bouncken, Clauß, & Fredrich, 2016). Furthermore, coopetition can assist firms to address major technological challenges, which in turn can generate benefits for partnering firms and advance technological innovation, as illustrated by the case of LCD coopetition between Sony and Samsung (Gnyawali & Park, 2011). The China-based international partnerships we studied ranged from clearly cooperative to clearly competitive, but with a significant number of cases positioned in-between these obvious ends of the spectrum. A binary division does not exist. Our findings provide a nuanced and contextualized understanding of the coopetition model by illuminating the dynamics and evolving process between partners involved in the collaborative partnerships that underpin

the development of innovation-related assets and capabilities through mutual learning and reciprocity.

Moreover, in the China context (although we clearly did not conduct an international comparative study) the conditions of market entry enforced by government agencies, guided by national economic development policy objectives, underlie some of the variability and some of the explanations for coopetition partnerships we examined. Requirements in specific industry sectors for certain kinds of technology transfer and training, provide a possible, partial explanation for the positive association between competitive partnerships and both QQR (quality and reliability of products) and RPS (range of products and services) output innovation. It may also provide a partial explanation for the positive association between competitive partnerships and significantly improved capacity of production or service innovation (CAPACITY). All of which were contrasted by the lack of association between cooperative partnerships with suppliers and customers and improved innovation performance. This evidence could suggest that foreign MNEs are successfully limiting the spillover effects of cooperative partnerships, up and down the local supply chain in China (see also Collinson, 2016).

Clearly a fuller test of these new propositions would require an international comparative study of partnerships in different contexts. As a future research aim this would lead to a deeper understanding of the unique characteristics of China's government-coordinated FDI environment and further insights for policy and practice. Our research offers empirical evidence that Chinese firms may take up the existing and forthcoming innovation challenges (Lewin, Kenney and Murmann, 2016) through collaborative partnerships. Clearly, under the specific definitions we adopt for our research, Chinese firms can innovate, particularly using 'creative adaptation' (contrasting the view taken by Abrami, Kirby and McFarlan, 2014, who use this term). But they face many challenges, not least the time lag associated with the development of fully indigenous technological capabilities. Government influence is pervasive and significant, but can be limiting as well as enabling (Collinson, 2016).

5.3. Implications for policy and practice

Some managers might question our finding; that competitive partnerships are more likely than cooperative partnerships to lead to improved output innovation. But successful partnerships between competitors appear to offer the best potential for recombined Oa

advantages in the form of improved quality and reliability of products (QQR) and range of products and services (RPS). Our case studies indicate that the role of Government in China could partly account for this and there are lessons for firms that have yet to enter the Chinese market in terms of the influence of sector-specific policies promoting technology transfer and local training.

The most important practical findings from our research show how MNEs and local firms alike can gain significant competitive advantage by maintaining a balanced, reciprocal give-and-take of ownership assets over a sustained period of time. The potential complementarities of the location-specific assets of local firms (including land, labour and privileged access to local networks – private and public sector) and the transferrable FSAs of MNEs (technology, manufacturing capabilities, brands etc.) can only be realised, developed and jointly-exploited where the partners avoid a clash of strategic interests and maintain agreement on the division of the spoils. Successful recombination for innovation takes time. Moreover, we would argue that mutual trust, organizational synergies and a strong collaborative relationship are more important in China-based partnerships, relative to other competitive environments, because firms still cannot rely on contracts, IPR regulations and broader institutional governance mechanisms in China to resolve disputes at large. The temptation for reneging on agreements is arguably higher as the likely penalties lower, or at best ambiguous.

Finally, our findings indicate that the exploitation of innovations resulting from the combined assets and capabilities of the partners appears to be mainly limited to the local Chinese market and to exports. The MNEs in our survey did not appear to be gaining significant transferrable FSAs through their China-based partnerships. Access to location-specific advantages (cheap labour, facilities and expertise, for example) provided a cost-advantage for exports from China. But we found little evidence of MNEs exploiting new, internalised innovation-related Oa advantages in other markets. We invite other scholars to join our endeavors and further advance this line of scholarly inquiry.

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Appendix A.

Dependent Variable:

Measuring innovation performance is tricky. Innovation has many dimensions and firms do not necessarily perform equally in every aspect. In this study we focus on two main types of innovation outputs, namely, product or service-related outputs, and process related outputs. The questionnaire asks respondents to estimate their respective firm's performance in ten different areas. The first four questions reflect product/service related outputs, while the remaining six questions reflect process related outputs.

The questions were stated as follows:

Please estimates the percentage of the following product or service-related outputs

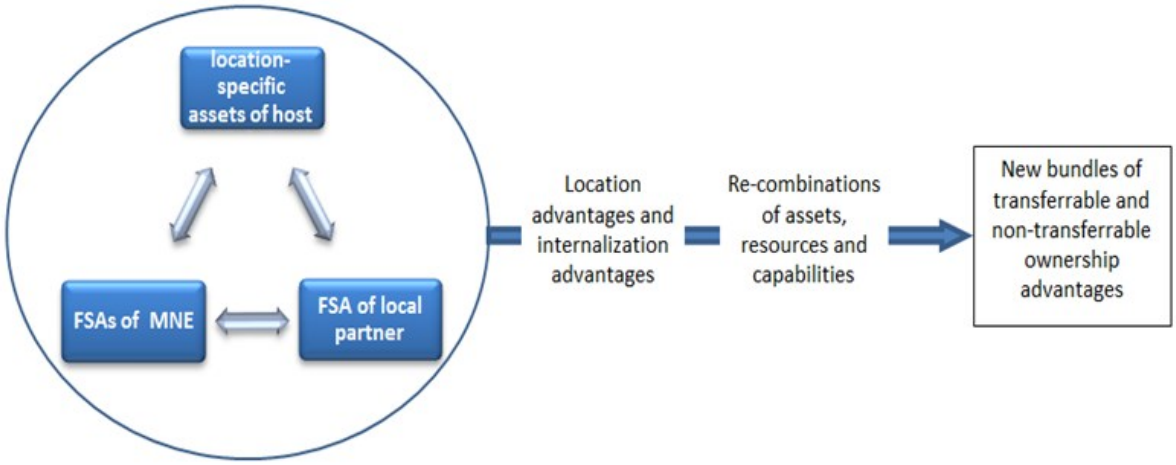
RPS = Increased range of products and services by….
DNP = Launched new products into the domestic market (as a % of total domestic sales revenue)
ENP = Launched new products for export (as a % of total export sales revenue)
QRP = Improved the quality or reliability of goods or service by…

Please estimate the percentage of the following process-related outputs.

CRT = Reduced time to respond to customer needs by…
CPS = Improved capacity of production or service by…
PDC = Reduced product design costs by…
PLT = Reduced production lead time by…
SR = Reduced scrap rate…
LC = Increased local (China) content by…

The above ten items have a Cronbach's alpha of 0.651. The respondents chose amongst five options: less than or equal to 10%, 11-25%, 26-50%, 51-75% and more than 76%. Since the underlying measure is continuous, we take midpoints of 5%, 13%, 38%, 63% and 88%, respectively. For the last category mid-point, we have assumed a maximum possible value of 100%. Non-responses are deemed to be zero either because the particular dimension is deemed irrelevant by the respondent, or because the respondent thinks it is zero.

Figure 1. A conceptual framework on new bundles of transferrable and non-transferrable ownership advantages through recombination of location-specific and firm-specific assets



Source: Collinson and Narula (2014).

Table 1. Some Representative Statistics of the Sampled Firms

Type of Partnership	*Supplier*	*Customer*	*Competitor*	*Public research institutions*	*Contractor (incl. consultancy)*	*Other*	Total sample
N	76	109	30	45	22	38	320
Sector	*Manufacturing*		*Construction*	*Service*	*Other*		Total sample
N	284		4	23	9		320
Partnership Life	*<3 years*		*4 years to 9 years*		*>10 years*		Total sample
N	177		127		16		320
Number of employees	*50-249*		*250-999*		*>1000*		Total sample
N	29		197		94		320

Table 2. Factor Analysis of the Three Output Innovation Variables

Panel A: Eigenvalues						
	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.411	47.021	47.021	1.295	43.178	43.178
2	0.888	29.605	76.626	1.003	33.448	76.626
3	0.701	23.374	100.000			

Panel B: Factor Loadings		
Variable	Factor 1	Factor 2
RPS	0.094	***0.995***
NP	***0.813***	0.044
QRP	***0.791***	0.110

RPS= range of products and services; NP= New products; QRP = quality and reliability of products

Table 3. Factor Analysis of the Six Process Innovation Variables

Panel A: Eigenvalues						
	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.753	29.212	29.212	1.347	22.450	22.450
2	1.294	21.575	50.787	1.325	22.079	44.528
3	.876	14.602	65.389	1.252	20.861	65.389
4	.827	13.784	79.174			
5	.694	11.573	90.747			
6	.555	9.253	100.000			

Panel B: Factor Loadings			
Variable	Factor 1	Factor 2	Factor 3
CRT	***0.866***	0.028	-0.084
CPS	0.305	-0.021	***0.682***
PDC	0.101	***0.831***	-0.003
PLT	***0.689***	0.018	0.441
SR	-0.061	***0.767***	0.172
LC	-0.129	0.211	***0.745***

CRT= reduced time to respond to customer needs; CPS = improved capacity of production or service; PDC = reduced product design costs; PLT = reduced production lead time; SR = reduced scrap rate; LC = increased local [China] content.

Table 4. Regression Results for Output Innovation

		Dependent Variable: Output-QQR (quantity, quality and reliability)			Dependent Variable Output-RPS (range of products and services)		
		Coefficient	t-stat	p-value	Coefficient	t-stat	p-value
Constant		-0.417	-1.237	0.217	0.265	0.783	0.434
Age		0.018	1.230	0.220	-0.019	-1.277	0.203
Revenue		-0.003	-0.113	0.910	0.019	0.766	0.444
Sector	Manufacturing	0.127	0.457	0.648	-0.086	-0.310	0.757
	Service	0.195	0.552	0.582	-0.175	-0.494	0.622
Length of Partnership	4 to 9 years	0.177	1.461	0.145	0.208	1.711	0.088
	10 years or more	0.927	3.559	0.000	0.431	1.652	0.100
Competitive partnership		0.390	1.855	0.065	0.567	2.697	0.007
Cooperative partnership	Supplier	-0.165	-1.049	0.295	-0.354	-2.244	0.026
	Customer	-0.159	-1.122	0.263	-0.059	-0.416	0.678
R-squared		7.62%			7.41%		

All dependent variables have zero mean and unit variance. Sample size = 306.

Table 5. Regression Results for Process Innovation

		Dependent Variable: PRC_TIME			Dependent Variable: PRC_COST			Dependent Variable PRC_CAPACITY		
		Coeff.	t-stat	p-value	Coeff.	t-stat	p-value	Coeff.	t-stat	p-value
Constant		0.028	0.082	0.935	-0.291	-0.892	0.373	0.115	0.345	0.730
Age		-0.004	-0.265	0.791	0.000	-0.013	0.989	-0.002	-0.123	0.902
Revenue		-0.017	-0.672	0.502	0.082	3.374	0.001	0.018	0.743	0.458
Sector	Manufacturing	0.121	0.423	0.672	0.257	0.943	0.347	-0.316	-1.140	0.255
	Service	0.043	0.120	0.904	0.545	1.601	0.110	-0.344	-0.993	0.321
Length of Partnership	4 to 9 years	0.095	0.774	0.439	-0.005	-0.047	0.963	0.139	1.166	0.245
	10 years or more	0.137	0.512	0.609	0.922	3.620	0.000	0.665	2.563	0.011
Competitive partnership		0.202	0.964	0.336	0.052	0.259	0.796	0.733	3.591	0.000
Cooperative partnership	Supplier	-0.350	-2.216	0.027	-0.062	-0.409	0.683	-0.053	-0.347	0.729
	Customer	-0.168	-1.197	0.232	-0.183	-1.360	0.175	0.165	1.207	0.228
R-squared		2.57%			11.10%			7.84%		

All dependent variables have zero mean and unit variance. Sample Size = 320.

Table 6. Summary of the Main Findings

		Output Innovation		Process Innovation		
		QQR	RPS	TIME	COST	CAPACITY
Competitive Partnership		+	+			+
Cooperative partnership	Supplier		–	–		
	Customer					

Note: Competitive and cooperative partnership effects contrast with the benchmark, namely public research institution (consultancies and other organisations not selected by respondents).